What is Claimed is:

1. A testing apparatus for simulating forces generated by pyrotechnic devices on a seat belt system, the testing apparatus comprising:

a pretensioner portion coupled to the seat belt system;

actuating fluid for being supplied to the pretensioner portion; and

a control portion that stores the actuating fluid at predetermined pressures selected to deliver the fluid to the pretensioner portion for simulating performance characteristics of pyrotechnic devices on the seat belt system.

2. The testing apparatus of claim 1 wherein the control portion includes a housing containing the actuating fluid, and a fast-acting valve that controls fluid flow between the housing and the pretensioner portion.

3. The testing apparatus of claim 2 wherein the fast-acting valve shifts between open and closed positions in approximately seven to eight milliseconds.

4. The testing apparatus of claim 2 wherein the fast acting valve includes a regulator therefor with the regulator applying a pneumatic signal to the valve.

5. The testing apparatus of claim 2 wherein the housing comprises an accumulator with the accumulator and the fast-acting valve being operable so that the pretensioner portion generates controlled jerk forces on the seat belt system, and the accumulator allows the actuating fluid to be contained under different predetermined pressures therein with the pressures selected to provide predetermined jerk forces to the seat belt system in the pretensioner portion.

6. The testing apparatus of claim 5 wherein the accumulator and the fast-acting valve are operable so that the selected fluid pressure in the accumulator is a linear function of the jerk force applied to the seat belt system via the pretensioner portion.

7. The testing apparatus of claim 1 wherein the actuating fluid is compressed air.

8. The testing apparatus of claim 1 including an energy dissipation module between the seat belt system and the pretension portion to prevent impacts against the pretensioner portion during testing operations.

9. The testing apparatus of claim 8 wherein the seat belt system includes a coupling member and the pretensioner portion includes a piston rod attached to the coupling member and extending through the energy dissipation module.

10. A test stand for evaluating a seat belt system using a pre-tensioner having a pyrotechnic gas generator by substituting a pneumatic energy source for the pyrotechnic gas generator, comprising:

an accumulator containing pressurized gas;

a pneumatic cylinder;

a valve coupling the accumulator to the pneumatic cylinder the valve having an opening time between a fully closed condition and a fully opened condition at least as fast as approximately five milliseconds; and

a piston in the pneumatic cylinder having connection means for connection to the seat belt system to pre-tension the seat belt system.

11. The test stand of claim 10 wherein the accumulator, the valve, the pneumatic cylinder and the piston cooperate such that, upon introduction of pressurized air from the accumulator into the pneumatic cylinder, the piston is displaced with a time rate of acceleration substantially linearly related to pressure in the accumulator.

12. The test stand of claim 10 wherein the accumulator, the valve, the pneumatic cylinder and the piston cooperate such that, upon introduction of pressurized air

from the accumulator into the pneumatic cylinder, the piston is displaced with a time rate of acceleration ranging between 50,000 g/per second and 1,000,000 g/per second and most preferably ranging between 50,000 g/per second and 376,000 g/per second.

13. The test stand of claim 12 wherein the time rate of acceleration of piston displacement of 50,000 g/per second is attained with an accumulator pressure of approximately 20 psi and the time rate of acceleration of piston displacement of 376,000 g/per second is attained with an accumulator pressure of approximately 200 psi.

14. The test stand of claim 10 further comprising a deceleration unit for absorbing acceleration energy imparted to said piston.

15. The test stand of claim 14 wherein said deceleration unit comprises a block of high density foam material and a coupling unit coupling the deceleration unit to the piston so as to compress said foam material after said piston is accelerated.

16. The test stand of claim 15 wherein said coupling unit comprises a piston rod joined at one end to said piston, and extending through said foam material.

17. The test stand of claim 10 wherein the seat belt system includes a supply of webbing wound about a spool and having a free end adjoined to a latch plate, said test stand further comprising connection means comprising a piston rod directly connected to said piston at one end, and indirectly coupled to said latch plate at the other end.

18. The test stand according to claim 10 wherein said valve operates upon the concurrence of two input signals.

19. The test stand of claim 18 wherein one of said input signals is pneumatic and the other of said input signals is electrical.

20. The test stand of claim 19 wherein said pneumatic input signal pre-loads said valve and said electrical signal triggers said valve for opening.

21. The test stand of claim 20 wherein said valve comprises a ball valve.

22. A method for testing seat belt systems, the method comprising:

coupling a seat belt system to a pneumatic test apparatus; and

pneumatically operating the test apparatus to simulate jerk forces applied by pyrotechnic pretensioners on the seat belt system.

23. The method of claim 22 including pressurizing pneumatic actuating fluid in an accumulator of the test apparatus, and controlling the pressure of the fluid in the accumulator to achieve a predetermined jerk force on the seat belt system.

24. The method of claim 22 including storing pneumatic actuating fluid under pressure and delivering the pressurized pneumatic fluid to a cylinder assembly with sufficiently steep rise time to generate a fluid pressure pulse applied to a piston of the cylinder assembly to provide desired jerk force values upon operation of the test apparatus.

25. The method of claim 22 wherein the test apparatus is pneumatically operated by delivering compressed air to a pretensioner portion of the apparatus.

26. The method of claim 25 wherein the compressed air is selectively delivered to the pretensioner portion by pneumatically biasing an electrically controlled valve disposed between an accumulator for the compressed air and a cylinder of the pretensioner portion.